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TECHNICAL REPORT

74-35-OR/SA

**A WORK ANALYSIS OF
FOOD SERVICE PERSONNEL AT
TRAVIS AFB, CALIFORNIA**

by

Mark M. Davis

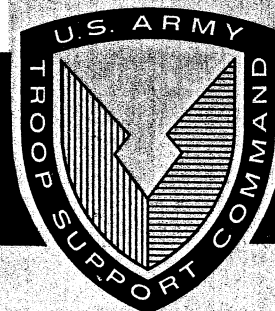
and

John R. Wetmiller

July 1973

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**UNITED STATES ARMY
NATICK LABORATORIES
Natick, Massachusetts 01760**



Operations Research and Systems Analysis Office

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1. REPORT DATE JUL 1973		2. REPORT TYPE		3. DATES COVERED	
4. TITLE AND SUBTITLE A work analysis of food service personnel at Travis AFB, California		5a. CONTRACT NUMBER			
		5b. GRANT NUMBER			
		5c. PROGRAM ELEMENT NUMBER			
6. AUTHOR(S) Mark Davis; John Wetmiller		5d. PROJECT NUMBER			
		5e. TASK NUMBER			
		5f. WORK UNIT NUMBER			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) US Army Natick Laboratories,ATTN: OR/SA,Kansas Street,Natick,MA,01760		8. PERFORMING ORGANIZATION REPORT NUMBER NATICK/TR-74/035-OR/SA			
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)		10. SPONSOR/MONITOR'S ACRONYM(S)			
		11. SPONSOR/MONITOR'S REPORT NUMBER(S)			
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited.					
13. SUPPLEMENTARY NOTES					
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15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES 49	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

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FOREWORD

During FY 1973-74, the Operations Research and Systems Analysis Office is conducting an investigation of Air Force food service under Task 03, Project No. 1J662713AJ45, Analysis and Design of Military Feeding Systems, of the DOD Food Research, Development, Test and Engineering Program. The effort is directed primarily towards defining, developing, and evaluating proposed modifications to the existing food service system with the objectives of improving performance and effectiveness, and identifying potential cost reductions, in that order of importance.

This report, one of several being published relating to the subject investigation, provides a detailed analysis of manpower utilization and performance in the food service facilities at Travis Air Force Base, California, which was selected as the primary study site. The purpose is to determine the distribution of effort among the various functions performed by food service personnel and to assess job performance in terms of productive work time and productivity. These data will provide a basis for effective recommendations to improve job definition, assignments, and scheduling.

ACKNOWLEDGEMENTS

This study was accomplished with the help of several individuals whom we wish to acknowledge. TSGT R. Foster, MACMET, Det 2, Travis AFB, assisted in the difficult task of collecting the actual data. LT W. Camp, Food Service Officer, Travis AFB, proved most cooperative throughout the study and thus facilitated the data collection through her continued support. Professor Paul Berger, College of Business Administration, Boston University, provided assistance in the statistical design and review of the study.

SUMMARY

A work sampling study was performed at Travis Air Force Base, Fairfield, California, as part of the Air Force Food Service System Study. The food service facilities included in the study were the three dining halls, the pastry kitchen, and the inflight kitchen. The purpose of this effort was to determine how food service personnel in the different job categories allocate their time on the job between various productive and non-productive functions.

In addition to evaluating total results for each of the facilities, differences in personnel performances and manpower utilization among dining halls were evaluated as a function of:

- a. the hours of the work day for each dining hall, and
- b. the days of the week for each dining hall.

Work sampling data were collected over a period of four weeks, 5 March — 18 March 1973, and 30 March — 12 April 1973. Observations on worker activities were recorded at the rate of 10-12 per hour. Each hour of the working day was observed an equal number of times in each dining hall.

The results of the study can be used to:

- a. assess personnel performance,
- b. develop working schedules for more effective manpower utilization, and
- c. determine the effects on manpower requirements for alternative methods of food preparation and warewashing.

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I. INTRODUCTION

A. Background:

The U. S. Army Natick Laboratories is conducting a food service system analysis at Travis AFB, California under the DOD Food Research, Development, Test and Engineering Program. The objectives of the analysis are to improve system performance, increase its effectiveness, and reduce the total annual operating costs. The results should be generally applicable throughout the Air Force.

The general approach to this project is as follows:

1. system studies
 - system evaluation
 - consumer research
 - environmental analysis
2. define improvements to the system
3. experimental evaluation of proposed improvements
4. recommend system improvements

The system evaluation is intended to define and characterize the existing system in terms of concepts, configuration and operations, and to establish the objectives, requirements, and constraints under which the system operates. Data will be collected and analyzed on the various elements of the total system, e.g., facilities, equipment, personnel, operations, consumer, and product. The performance and effectiveness will be used to identify existing deficiencies and inefficiencies in the system, to determine potential alternative improvements, and to assess their impact in terms of cost and benefits.

Consumer research is comprised mainly of an attitudes survey to identify factors determining and/or influencing customer utilization and acceptance of the food service system and other relevant information, and a food preference survey to establish food preference patterns as a basis for menu development to enhance and, therefore, increase utilization of the system.

The environmental analysis will examine existing dining facility environments to define the needed improvements for increasing consumer satisfaction with minimum change and cost. Physical conditions within the dining hall are assessed, consumer attitudes relative

to these conditions are measured, and behavior in the dining hall is observed and recorded. Relationships between these various data can then be determined as a basis for establishing design intentions and criteria for modifying the environment.

Following the completion of these initial efforts, the resulting proposed changes will be implemented, insofar as practicable, at Travis AFB for experimental evaluation, i.e., to test the underlying assumptions, validate the results, and assess and refine the alternatives. Comparative analyses will also be performed at two other Air Force installations--Minot AFB, North Dakota, and Homestead AFB, Florida (which represent differences in location, mission, climate, size, etc.)-- for the purpose of verifying the findings and conclusions and their potential for application to other installations. A final report will be prepared and submitted to the Air Force containing the recommended changes to the existing base food service operations indicating improved performance, increased effectiveness and cost reductions for the total system, and providing a plan for their implementation.

B. Purpose:

The purpose of personnel evaluation is to examine the performance and effectiveness of the operating personnel in the food service facilities at Travis AFB. In particular, the work sampling study was performed to determine the distribution of functions, and the level of activity associated with each function for the various job categories. Individual job satisfaction and performance measurements are also to be obtained in an attempt to identify those factors affecting personnel effectiveness and productivity. Correlation of these data should allow for identifying problem areas and suggest corrective actions to be taken to achieve better manpower utilization through improved job definition, assignments, and scheduling.

C. Objectives:

The objectives of the work sampling study were to:

1. Determine how food service personnel allocate their time during working hours between productive and non-productive activities;
2. Determine the percentage of time required for each of the different work functions that are performed in the dining halls;
3. Identify significant differences in productivity and work functions among the individual dining facilities;
4. Identify significant differences in productivity and work functions among the hours of a work day; and

5. Identify significant differences in productivity and work functions among the days of the week.

II. SYSTEM DESCRIPTION

The food service system at Travis AFB consists of three dining halls, an inflight kitchen, and a pastry kitchen. While emphasis was placed on the three dining halls, the remaining two facilities were also evaluated.

A. Dining Facilities:

In charge of each dining facility is a military dining hall supervisor, responsible directly to the base Food Service Officer. Civilian shift leaders and military cooks report to the supervisor, and civilian cooks and food service workers report to the shift leader. In the absence of the dining hall supervisor, the military cooks receive their instructions from the shift leader in charge. Personnel staffing levels (actual) for each dining hall are presented in Table B-1.

The dining halls are open for service during the hours shown below:

Dining Hall #1	Weekdays	Weekends
Breakfast	0600-0830	
Dinner	1100-1300	Same
Supper	1500-1800	
Late Supper	1930-2030	as
Midnite Meal	2300-0100	
Early Morning Meal	0230-0330	Weekdays
Dining Halls #3 and #7	Weekdays	Weekends
Breakfast	0600-0800	0700-1000
Dinner	1100-1300	1100-1500
Supper	1500-1800	

In Dining Hall 1, there are three work shifts:

Weekdays and Weekends

Morning	0500–1330
Afternoon	1030–1900
Evening	1930–0400

while in Dining Halls 3 and 7 there are only two work shifts:

	Weekdays	Weekends
Morning	0500–1300	0600–1430
Afternoon	1030–1900	0730–1600

Since Dining Hall 1 operates continuously, a member of the evening shift must remain until the morning shift reports. Also, at least one member usually reports early (1830) to prepare for the late evening meal. The shift schedules listed above are representative and do not apply to all personnel. For example, the food service workers usually report 1/2 hour later (and work 1/2 hour later) than the cooks. In addition, specific schedules are sometimes established on an individual basis to fit personal needs (e.g., one cook with children works 0800–1630).

B. Inflight Kitchen:

The inflight kitchen prepares meals for flight crews, passengers, and ground maintenance crews, and is, therefore, open 24 hours a day, seven days a week. Box lunches, snacks, frozen meals (which are reheated in flight), and other types of rations are available. The staffing level (actual) for the inflight kitchen is included in Table B-2.

C. Pastry Kitchen:

The pastry kitchen prepares all pastry items for the three dining halls and the inflight kitchen (bread products are bought from an outside vendor). The pastry is delivered once a day, Monday through Friday in the morning. Since the pastry kitchen works a five day week (Monday – Friday) from 0500–1300, the pastry prepared on a given day is delivered the following morning (pastry for the weekend is prepared on Thursday and delivered on Friday). The pastries include fruit pies, cream pies, sheet cakes, layer cakes, and cookies. Personnel staffing level (actual) for the pastry kitchen is presented in Appendix B-3.

D. Staffing Levels — Actual, Authorized, and Standard:

The Tables in Appendix B list the actual personnel presently assigned to the three dining halls, inflight kitchen, and pastry kitchen. Table 1 shows the difference between the actual staffing levels and the amount authorized by regulation. It also compares actual vs the standard as calculated in AFM 26-3.

The table shows that while the total actual personnel is consistent with the total authorized and the total standard, there are large discrepancies in individual facilities and job categories.

TABLE 1

STAFFING LEVELS – ACTUAL VS AUTHORIZED

	Dining Hall 1		Dining Hall 3		Dining Hall 7		Pastry Kitchen		Inflight Kitchen		Total	
	Act	Auth	Act	Auth	Act	Auth	Act	Auth	Act	Auth	Act	Auth
Dining Hall Supervisors	1	1	1	1	1	2	1	1	1	1	5	6
Military Cooks	5	6	4	2	4	5	2*	3*	5	3	20	19
Civilian Shift Leaders	8	5	2	2	3	2	0	0	1	1	14	10
Civilian Cooks	5	6	6	4	5	8	1*	1*	4	1	21	20
Food Service Workers	19	24	10	8	11	14	1	0	1	2	42	48
TOTAL	38	42	23	17	24	31	5	5	12	8	102	103

STAFFING LEVELS – ACTUAL VS STANDARD

	Dining Hall 1		Dining Hall 3		Dining Hall 7		Pastry Kitchen		Inflight Kitchen		Total	
	Act	Stand	Act	Stand	Act	Stand	Act	Stand	Act	Stand	Act	Stand
Dining Hall Supervisor	1	1	1	1	1	1	1	1	1	1	5	5
Cooks	18	15	12	10	12	15	3*	5*	10	10	55	55
Food Service Workers	19	17	10	11	11	16	1	0	1	0	42	44
TOTAL	38	33	23	22	24	32	5	6	12	11	102	104

*Bakers

III. SURVEY METHODOLOGY

A. Introduction:

Work Sampling consists of taking a large number of observations on individuals performing tasks in a work situation. The task being performed at each observation is recorded. From the ratio of the number of observations of workers performing a specific task to the total number of observations, one can infer the proportion of time that is actually spent on that particular activity. The larger the number of observations, the more accurate is the inference.

Observations are usually made on a random basis to obtain statistically valid results. However, in non-repetitive situations, observations can be made on a systematic basis without introducing bias, provided the interval between observations is sufficiently small. This approach was used in this study to maximize the sample size in any given observation period.

B. Job Classifications:

For simplicity, job classifications were limited to six categories coinciding with the position descriptions:

1. Dining Hall Supervisor
2. Military Cook
3. Civilian Shift Leader
4. Civilian Cook
5. Civilian Food Service Worker
6. Baker

Complete definitions for these job classifications are included in Table C-1.

C. Task Definitions:

The task definitions used in the study are based primarily on those used in reference (4). For purposes of analysis, these activities are arranged in the groups and sub-groups outlined in Figure 1. Detailed definitions of the tasks are presented in Table C-2.

Figure 1

WORKER ACTIVITIES

I. Direct Work

A. Food Preparation

1. Prepares for Cooking
2. Cooks Foods
3. Prepares Soups, Salads, Desserts, and Breads
4. Prepares Cooking Utensils

B. Serving Food

1. Serves Food
2. Sets Up, Replenishes, and Tears Down Serving Line

C. Sanitation

1. Cleans Kitchen, Equipment, and Utensils
 - a. Cleans Cooking Utensils
 - b. Cleans Equipment
 - c. Cleans Kitchen
2. Cleans Dining Hall, Clipper Room, Serving Line, Dishes, Silverware and Glasses
 - a. Cleans Tables
 - b. Operates Dishwasher
 - c. Cleans Dining Room and Clipper Room
 - d. Personal Hygiene

II. Indirect Work

A. Supplies

1. Receives Supplies
2. Maintains Supplies
3. Issues Supplies

B. Administrative

1. Prepares Correspondence and Records
2. Telephone

C. Supervisory

1. Monitors Reports and OJT Program
2. Coordinates
3. Inspects
4. Gives Supervision
5. Receives Supervision

D. Mess Check

1. Cash Collection and Headcount

E. Miscellaneous

1. OJT
2. Maintenance

III. Non-Productive

- A. Designated Rest Break
- B. Other
- C. Absent
- D. Walking

D. Observation Schedule:

The data collection was scheduled over a period of four (4) weeks: 5–18 March, and 30 March – 12 April 1973. The purpose of this was to guarantee that (a) a minimum number of observations be taken in any given job category to assure a specified level of accuracy, and (b) all hours of the work day for each dining facility be equally represented.

Table C-3 shows the schedule of observations for the study. Each hour of operation for each dining hall was observed three times during week days and once on the weekends. Observation periods were established at two hours maximum, except where both shifts overlapped during the noon meal. In this case, the period was three hours, and there were two observers present. For all other observation periods, there was only one observer recording data.

E. Data Collection Procedure:

An initial trial period of two days was required to test and refine the data collection procedures, to provide training experience for the observers, and to permit the food service personnel to become accustomed to their presence.

Certain criteria were established for recording observations. Since this study was concerned with the major activities being performed, a worker slicing vegetables was recorded as "preparing food" and not "using knife", a person mopping the floor was "cleaning kitchen" and not "wringing mop" or "filling pail", and so forth.

If a worker were performing a function that required his presence at a specific location, whether or not he was actually productively engaged, he was recorded as actually performing the task (e.g., a server on the food line was required to be there throughout the meal whether or not there was anyone to serve).

The walking function was recorded only when an individual was observed walking with no apparent reason. For example, a person walking with hot food for the serving line was recorded as "refilling serving line".

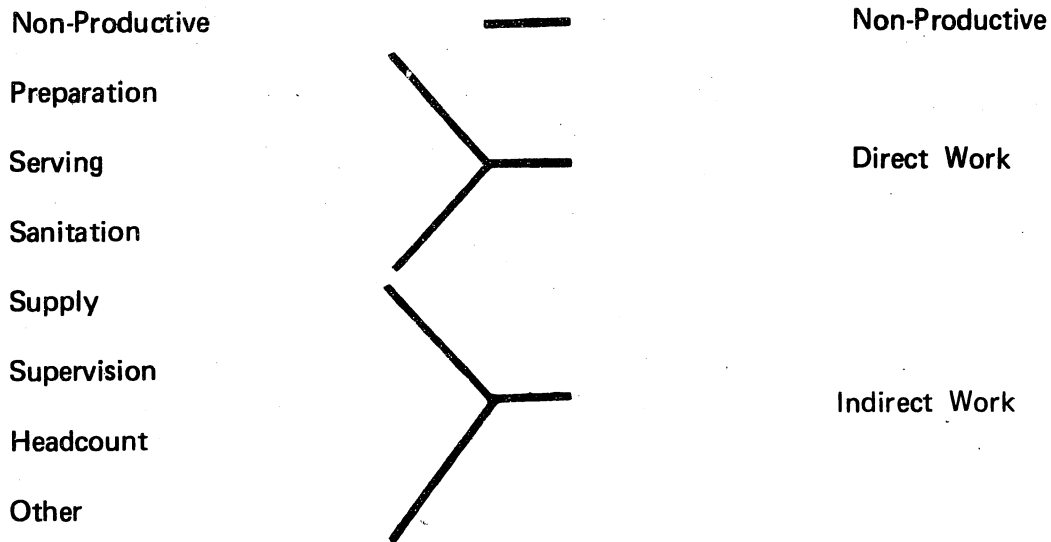
The form shown in Figure C-1 was used to record data. Before the beginning of each observation period, the observer recorded the dining hall number, date, the beginning and end of the observation period, day of week, and observer code. He also noted the name and position of every person working during the period at the head of the columns. The time of each observation round was recorded in the left hand column (a 24-hour clock was used). The interval between observations was 5–6 minutes (or 10–12 observations per person per hour).

Every job position in the dining hall was assigned a one-digit code (e.g., dining hall supervisor — 1, civilian shift leader — 3, etc). Each task listed in the definitions was assigned a two-digit code (e.g. prepares for cooking — 11, serves food — 21, operates dishwasher 42, etc.). Thus, for each observation, three digits were recorded in the appropriate boxes. The first digit signified the person being observed, the second and third represented what he or she was doing when observed. The data sheets were subsequently keypunched onto cards for analysis by computer.

IV. RESULTS AND ANALYSIS

A. Overview of Dining Hall Personnel Activities

For analysis the discrete work functions shown in Figure 1 were grouped as shown below:



The graphs in Figure 2 illustrate how the personnel in different jobs allocate their time among the various activities. The following comments are offered:

1. The graph for all personnel shows that 32% of all the workers' time is spent on non-productive activities. This includes 12% which is for authorized rest breaks and meal times; hence, 20% of their total time can be viewed as "truly" non-productive.

2. Dining hall supervisors spend 50% of their time in non-productive functions, including time absent from the dining halls for staff meetings, personnel problems, etc. Approximately 40% is devoted to supervisory functions, and the remaining 10% of their time is divided among the other six categories.

3. The duties of military cooks vary from dining hall to dining hall. Considering only productive time as seen in the graph, military cooks in Dining Hall 1 spend most of their time on supply; their counterparts in Dining Hall 3 are primarily engaged in supervision and supply; and in Dining Hall 7 their time is essentially distributed between preparation, headcount, and serving.

4. As expected, food service workers allocate a relatively high percentage (45%) of their time to sanitation.

FIGURE 2

PERSONNEL PERFORMANCE BY DINING HALL

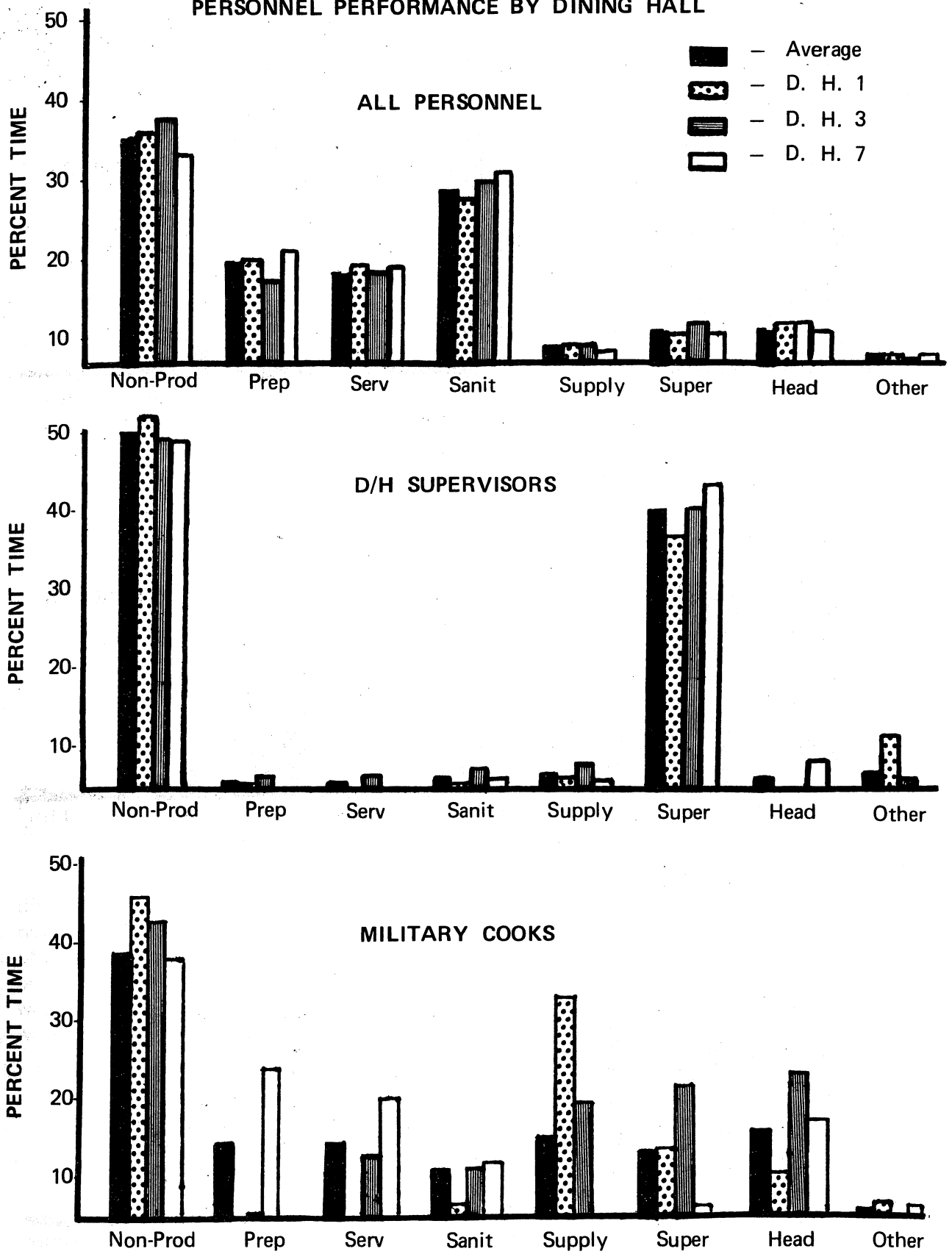
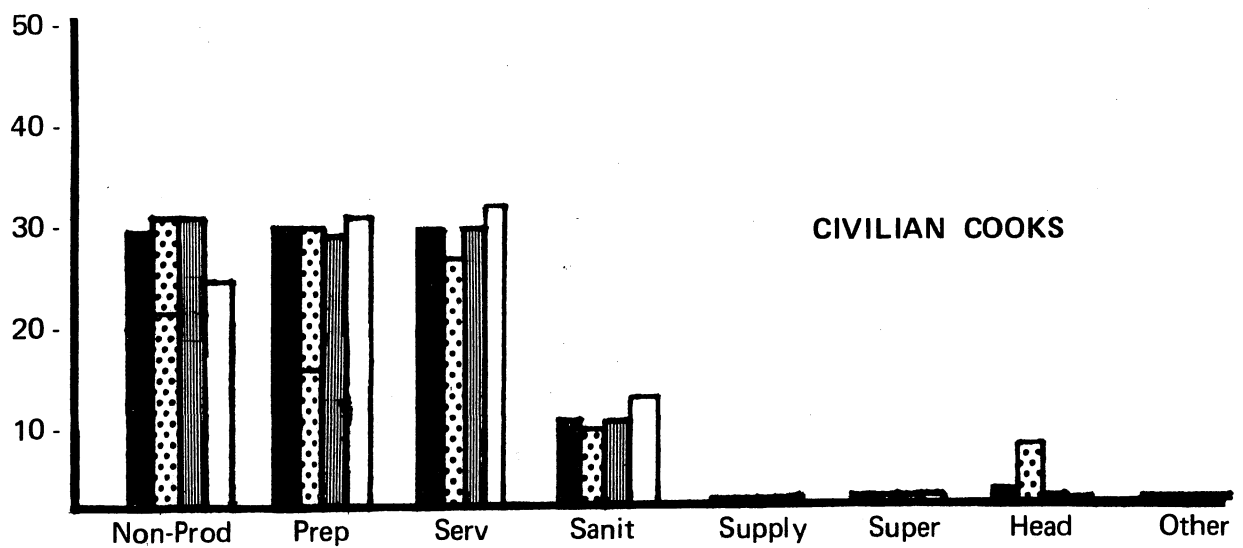
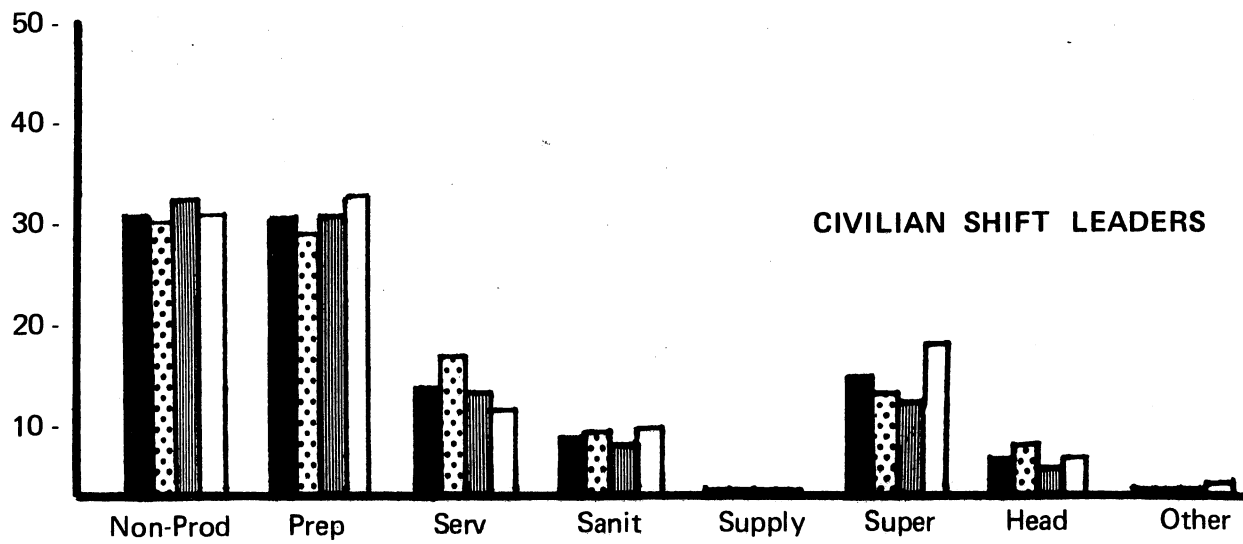
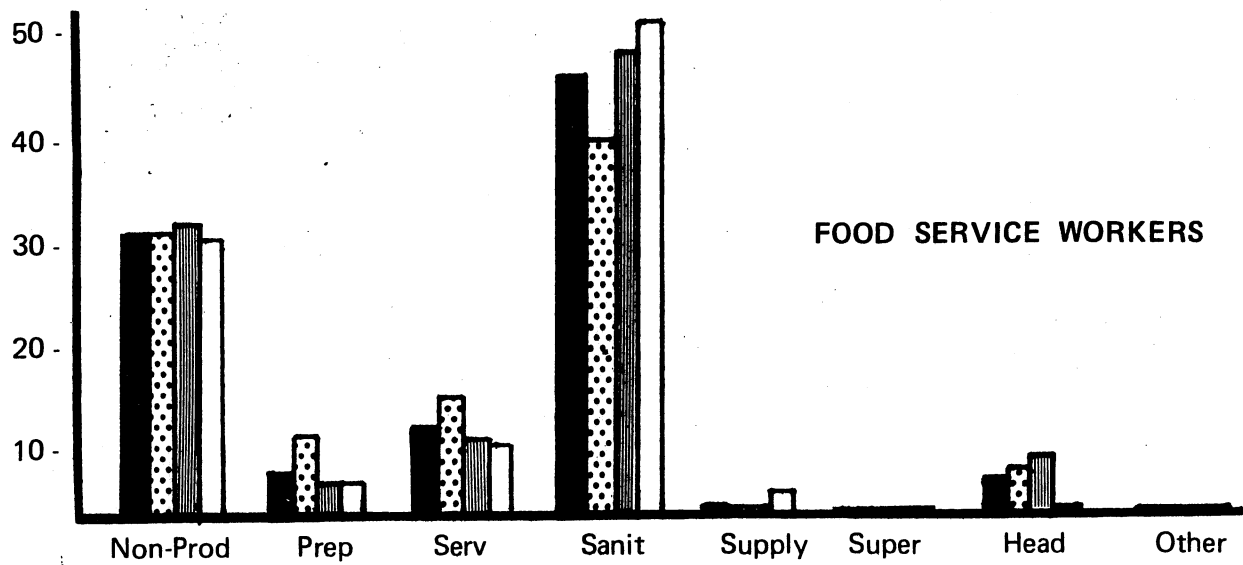


FIGURE 2 (cont'd)



5. Civilian shift leaders spend about 30% of their time on food preparation and about 13% of their time on the serving line. Only 13% of their time is directed towards supervisory functions. In this regard, two facts are to be noted. First, in certain situations there are several shift leaders concurrently on duty. Generally, in these cases, one shift leader will assume the supervisory role during the dining hall supervisor's absence, while the others perform cooks' functions. In addition, shift leaders usually spend their time between cooking and supervisory functions. Hence, the average percent of time spent by shift leaders in supervisory capacity is relatively small when compared with the amount of time the dining hall supervisor is absent.

6. Civilian cooks split most of their productive time evenly between preparation and serving.

7. In comparing military cooks with civilian cooks, their jobs are very dissimilar with respect to the amounts of time associated with the different activities performed, and similarly for dining hall supervisors compared with civilian shift leaders.

B. Dining Halls — An Analysis of Activities by Hour and Day

Figure 3 presents profiles of work activities for each job classification in the three dining halls. Each graph provides the following information by hour of the day for each job category:

- a. the percentage of time spent on non-productive activities,
- b. the percentage of time spent on direct work,
- c. the percentage of time spent on indirect work, and
- d. the hours corresponding to weekday mealtimes.

Table 2 which is derived from these graphs considers, for each job classification the relation of job activities to mealtime and also the consistency of job activities among dining halls.

Dining hall supervisors' activities vary throughout the day and do not seem to correlate directly with mealtimes. On the other hand, the activities of civilian cooks and food service workers are highly related to mealtimes, which involve a relatively high proportion of direct work. The distribution of work for the civilian shift leaders only partially depends on whether or not it is mealtime and reflects the variety of activities performed. The work activities of the military cooks differ from one dining hall to another, and vary with respect to their relationship to mealtimes.

TABLE 2

OBSERVATIONS ON JOB ACTIVITIES

Job Classification	Relation of Activities to Meal Times	Consistency Among Work Activities Between Dining Halls
Dining Hall Supervisor	Independent	Consistent
Military Cook	Partially Dependent	Inconsistent
Civilian Shift Leader	Partially Dependent	Somewhat Inconsistent
Civilian Cook	Very Dependent	Consistent
Food Service Worker	Very Dependent	Consistent

FIGURE 3

PERSONNEL PERFORMANCE BY HOUR OF THE DAY

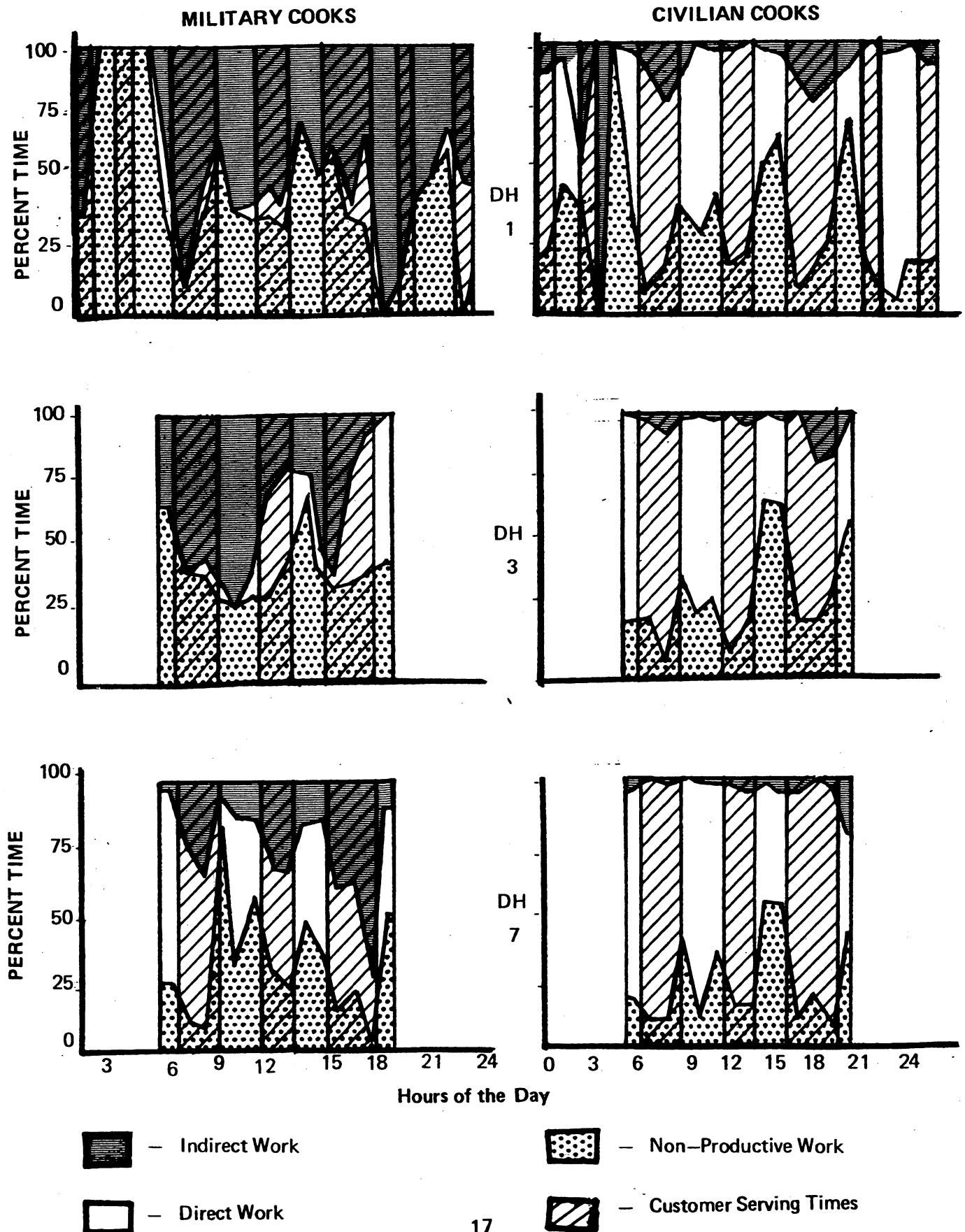


FIGURE 3 (cont'd)

PERSONNEL PERFORMANCE BY HOUR OF THE DAY

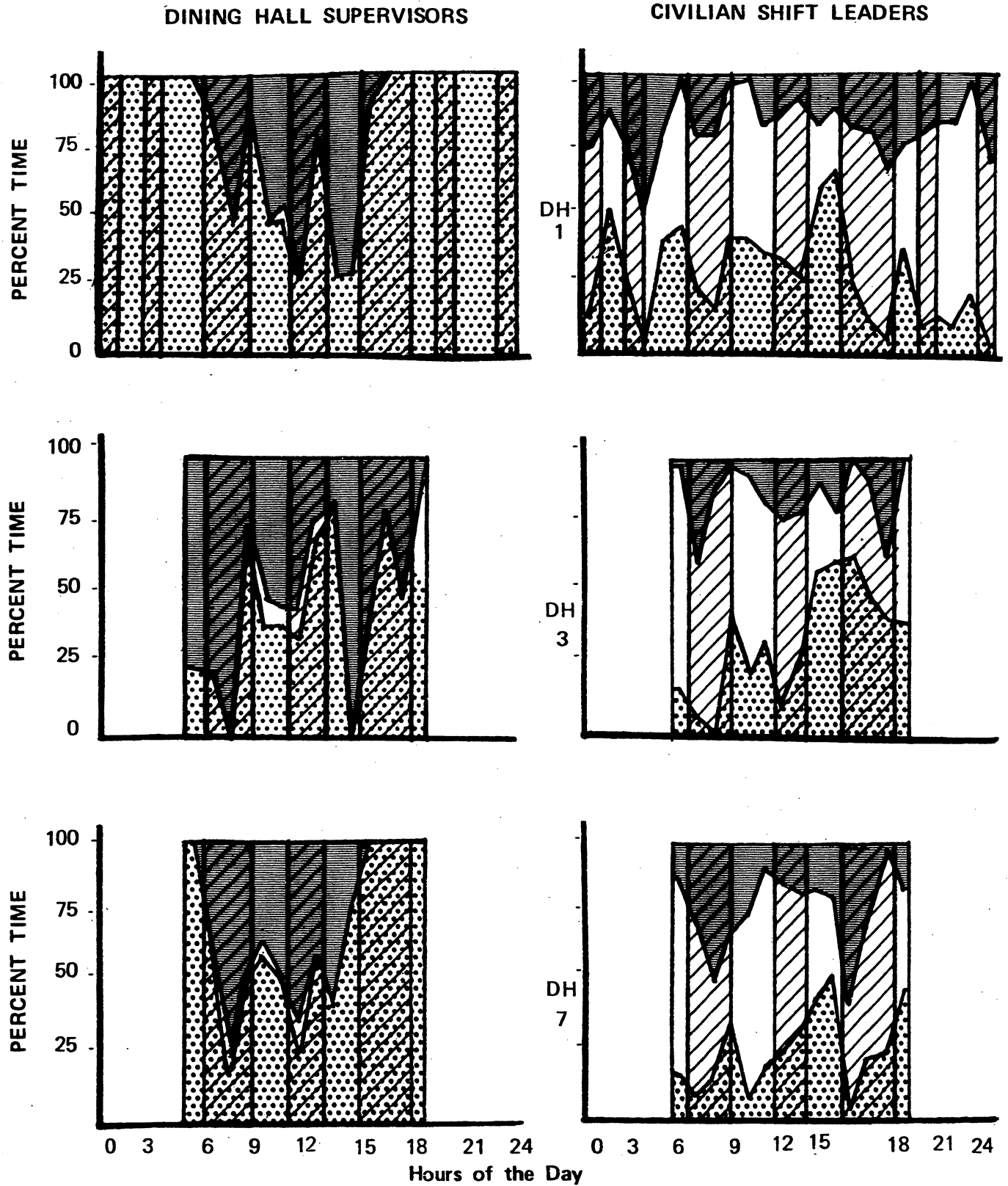
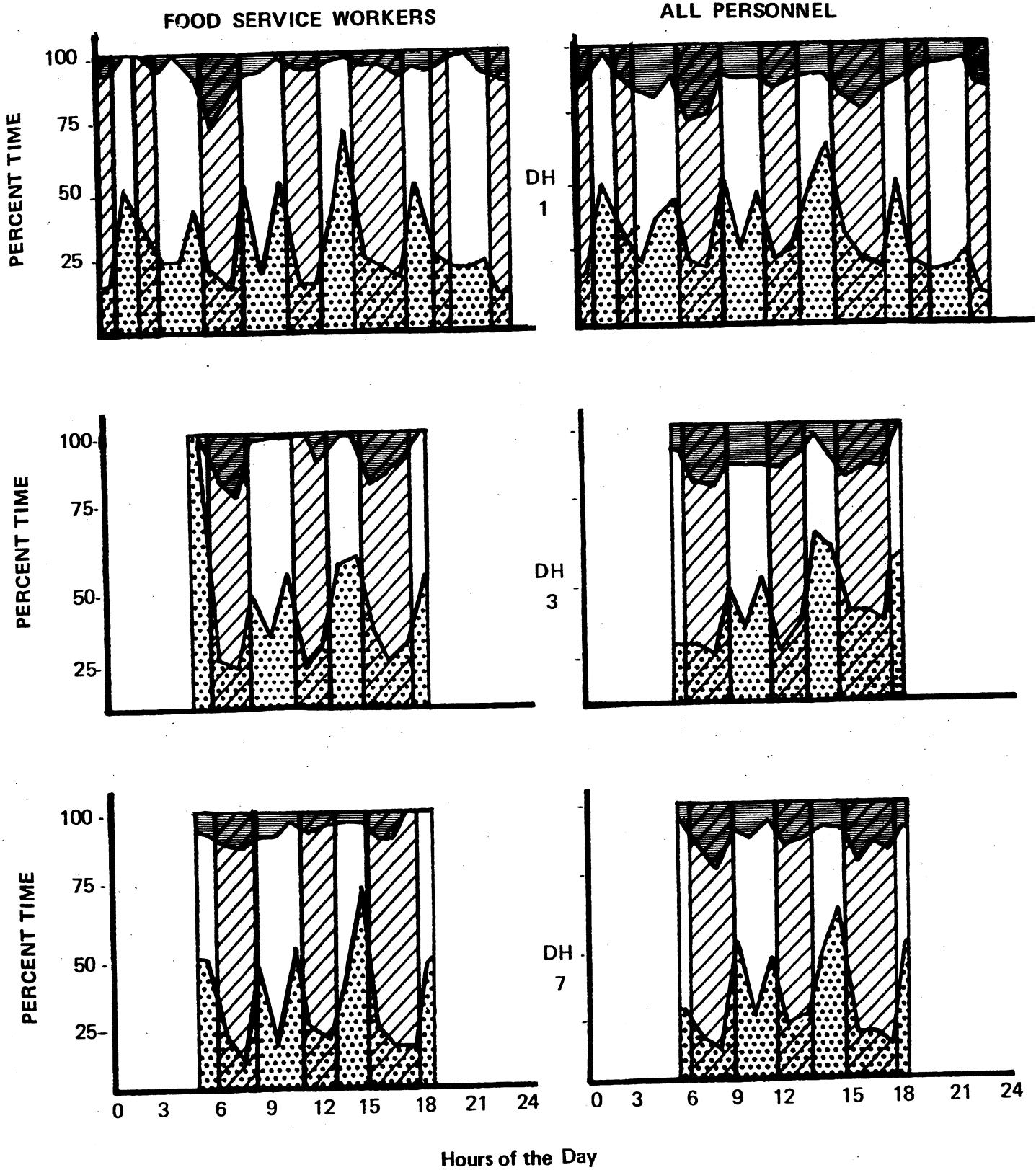


FIGURE 3 (cont'd)

PERSONNEL PERFORMANCE BY HOUR OF THE DAY



The functions performed by the dining hall supervisors, civilian cooks, and food service workers seem to be reasonably consistent among dining halls, suggesting that the tasks performed by the people are reasonably well defined. On the other hand, the work activities of the military cooks, and to a lesser degree of the civilian shift leaders, differ significantly among the dining halls. This suggests that military cooks' duties are less rigid. The lack of consistency among the civilian shift leaders results in part from the fact that when more than one shift leader is on duty at the same time, one assumes the supervisory role while the others act as cooks.

An analysis of worker activities in the three dining halls as a function of the day of the week, indicates:

1. There is little difference among the three dining halls with respect to the amount of time spent on direct, indirect, and nonproductive activities.
2. Dining hall supervisors in all three dining halls spend some 50% of their time in non-productive functions during the week. The supervisors are not on duty on weekends.
3. The duties of military cooks vary from dining hall to dining hall and, in fact, tend to vary somewhat throughout the week.
4. The relative amounts of time that civilian shift leaders spend on direct, indirect, and non-productive functions remain fairly constant with respect to dining hall and day of the week.
5. Similarly, the time civilian cooks and food service workers spend on direct, indirect, and non-productive functions also remains fairly constant with respect to dining hall and day of the week.

C. Productivity

The number of meals served and the number of man-hours worked at each of the three dining halls over a typical two week period are included in Table B-4. From this information, a measure of productivity, i.e., average meals per man-hour can be calculated as shown below:

		S	M	T	W	T	F	S	Total
Dining Hall	1	5.7	6.4	6.6	7.0	6.8	5.9	5.2	6.3
	3	6.2	6.6	6.0	6.7	6.3	5.7	6.1	6.2
	7	6.0	8.8	7.8	7.6	7.6	7.2	6.5	7.5

Average Meals Served Per Man-hour

As can be seen, weekend productivity is only slightly less than on weekdays. Lower weekend attendance alone would tend to substantially reduce weekend productivity. However, as the number of weekend man-hours worked is also lower, weekend productivity is approximately the same as obtained for weekdays.

Average meals per man-hour by meal, graphed in Figure 4, were determined for each dining hall using the following equations:

$$\begin{aligned}\text{Breakfast productivity} &= \frac{\text{Breakfast attendance}}{1/2 \times \text{First shift man-hours}} \\ \text{Dinner productivity} &= \frac{\text{Dinner attendance}}{1/2 \times (\text{First and Second shift man-hours})} \\ \text{Supper productivity} &= \frac{\text{Supper attendance}}{1/2 \times \text{Second shift man-hours}} \\ \text{Late evening productivity} &= \frac{\text{Late evening attendance}}{\text{Third shift man-hours}}\end{aligned}$$

Note the 10.5 meals per man-hour for supper in Dining Hall 7. This high rate is not due to understaffing, but rather to a very high supper attendance figure. For the two week period considered, supper attendance was 4343 for 824 second shift man-hours, while in Dining Halls 1 and 3 supper attendance was, respectively, 2850 for 815 second shift man-hours and 2130 for 608 second shift man-hours. An alternative measure of productivity, average meals per man-hour by dining hall shift, is graphed in Figure 5 for each dining hall and was calculated using the following equations:

$$\begin{aligned}\text{First shift productivity} &= \frac{\text{Breakfast attendance} + 1/2 \times \text{Dinner attendance}}{\text{First shift man-hours}} \\ \text{Second shift productivity} &= \frac{1/2 \text{ Dinner attendance} + \text{Supper attendance}}{\text{Second shift man-hours}} \\ \text{Third shift productivity} &= \frac{\text{Late evening attendance}}{\text{Third shift man-hours}}\end{aligned}$$

The number of breakfasts eaten at each dining hall is substantially lower than the number of dinners eaten. However, breakfast productivity is only slightly higher than dinner productivity in each of the three dining halls. Given that preparation for the breakfast meal is much less time consuming than for the dinner meal, a significantly high breakfast productivity should be realized. Hence, it can be inferred that the first shift in all three dining halls is overstaffed relative to the second shift.

Figure 4
MEALS/MAN-HOUR BY MEAL

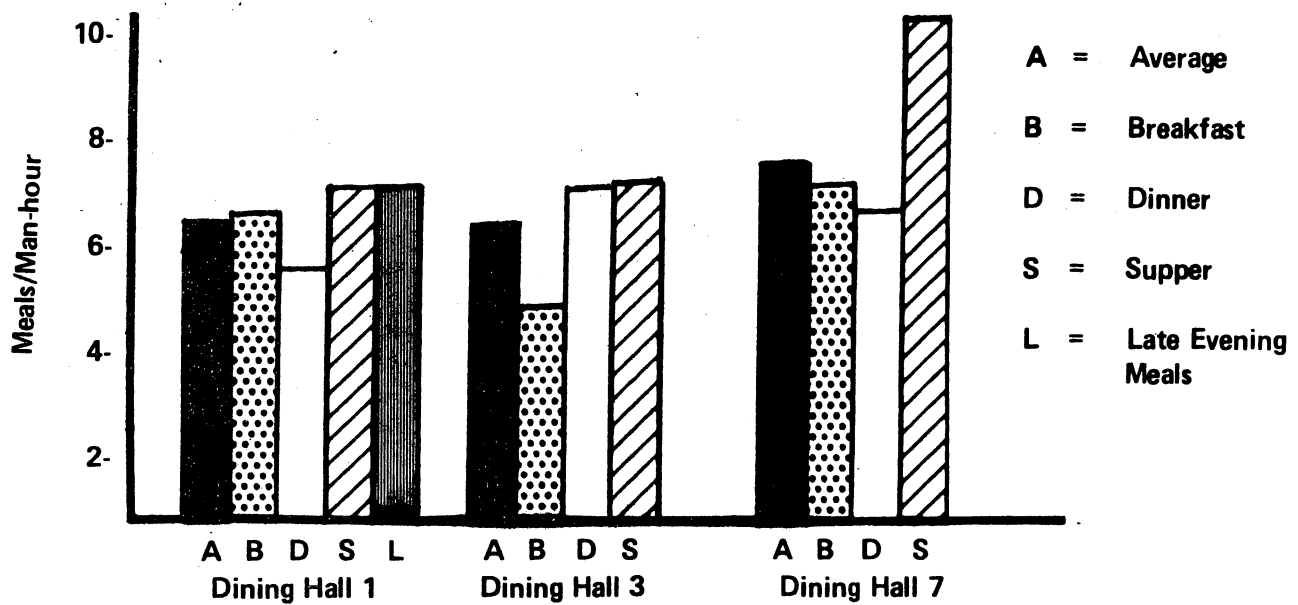
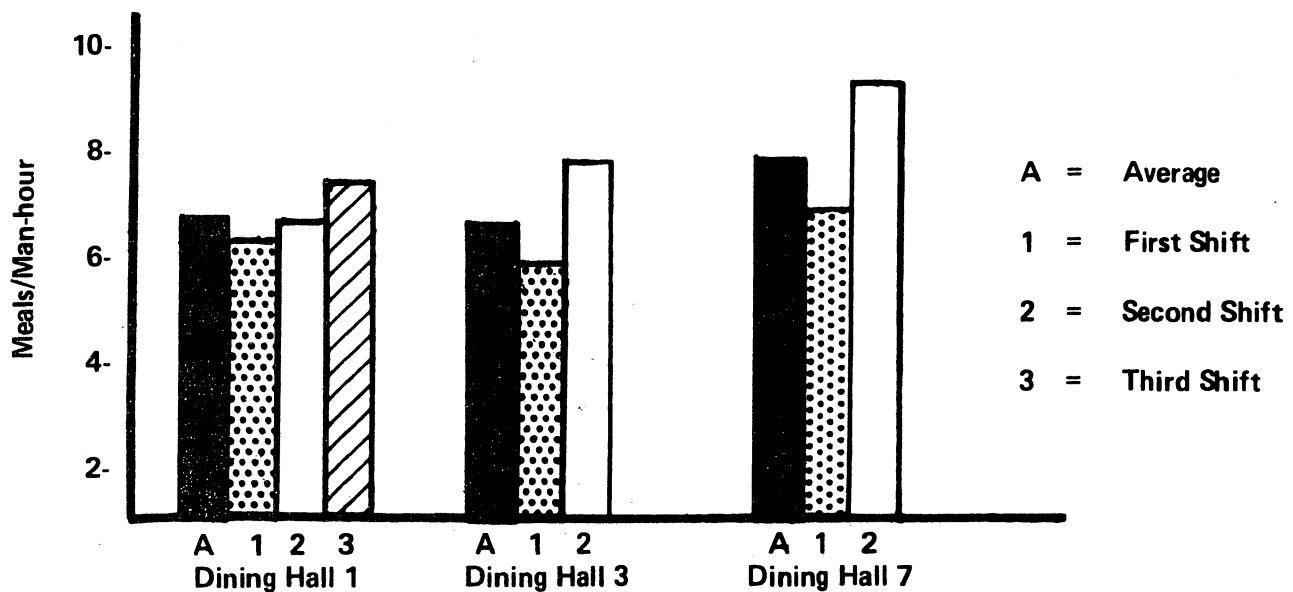


Figure 5
MEALS/MAN-HOUR BY SHIFT



Also, Figure 5 shows that productivity on the third shift in Dining Hall 1 is higher than that on either the first or second shifts. When this is considered in relation to the fact that during the two week period 4117 late evening meals were served for only 584 man-hours worked (at a maximum of six workers per third shift), it is apparent that the third shift is understaffed. This would seem to be especially true when it is remembered that this shift must serve and prepare for three different meals.

The meals per man-hour are calculated above only for the hours actually worked (not including absentee time) by personnel assigned to the dining halls during the period of observation. To obtain a measure of total meals per man-hour for the entire food service system (excluding the inflight kitchen), all personnel in the administration office and commissary support must also be included. Then, the average meals per man-hour for the entire system at Travis is calculated as follows:

a. Average number of meals served per week (July – December 1972) 16,273.

b. Total man-hours per week for all assigned personnel:

Dining Halls	3400
Pastry Kitchen	200
Administration	320
Commissary	280
TOTAL	<u>4200</u> man-hours

c. Average meals per man-hour = $16,273/4200 = 3.9$

D. Inflight Kitchen

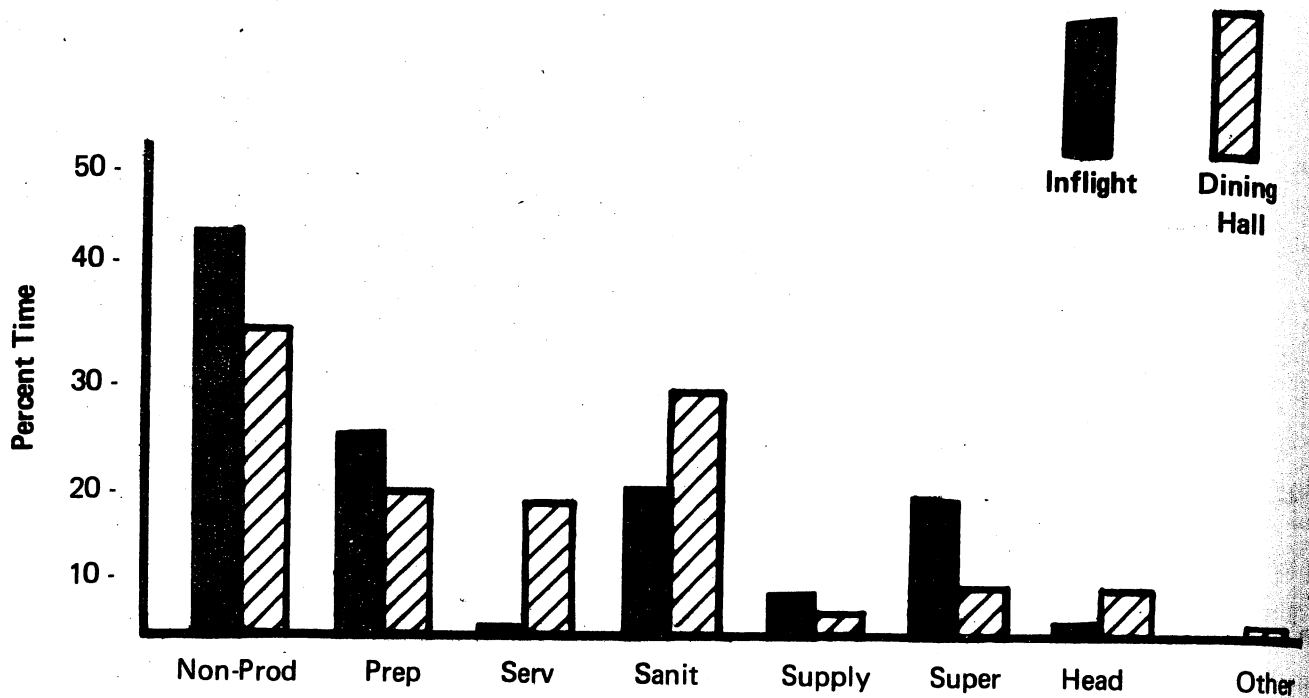
The inflight kitchen is open 24 hours a day, seven days a week. This facility, like the dining halls, has a varying work load throughout the day. Although certain preparatory functions are performed at specified times each day, the actual issuance of meals varies considerably with time.

The graph in Figure 6 shows a comparison of times allocated to the different work functions between inflight kitchen and dining hall personnel. Below the graph is a breakdown of work functions among the individual job classifications in the inflight kitchen. As can be seen from the graph:

1. Both the serving and headcount functions are markedly lower in the inflight kitchen because one individual will usually sign for and pickup all the meals for an entire flight or maintenance crew.

FIGURE 6

INFLIGHT PERSONNEL VS DINING HALL PERSONNEL



Work Functions

Inflight Personnel (All):	42.0	21.6	1.7	15.4	4.1	14.1	1.1	0.0
Supervisor	54.6	0.0	0.0	1.3	6.7	36.1	1.3	0.0
Military Cook	48.4	18.7	4.6	10.5	4.6	13.2	0.0	0.0
Civ. Shift Ldr.	35.6	28.8	0.0	19.0	4.2	8.3	4.1	0.0
Civilian Cook	32.1	46.1	0.0	5.7	2.9	13.2	0.0	0.0
Food Serv. Wkr.	33.4	0.0	0.0	63.0	1.8	1.8	0.0	0.0

2. Non-productive time is higher by 9.8% in the inflight kitchen, again due to the fact, as noted above, that the serving and headcount functions require much less time.
3. The percent of time allocated to sanitation is 9.8% lower in the inflight kitchen as would be expected (no dishwashing).

E. The Pastry Kitchen

The pastry kitchen, unlike the dining halls, has a fairly constant work load. Hence, it should be operated more efficiently as the production quantities are known in advance and can thus be properly scheduled.

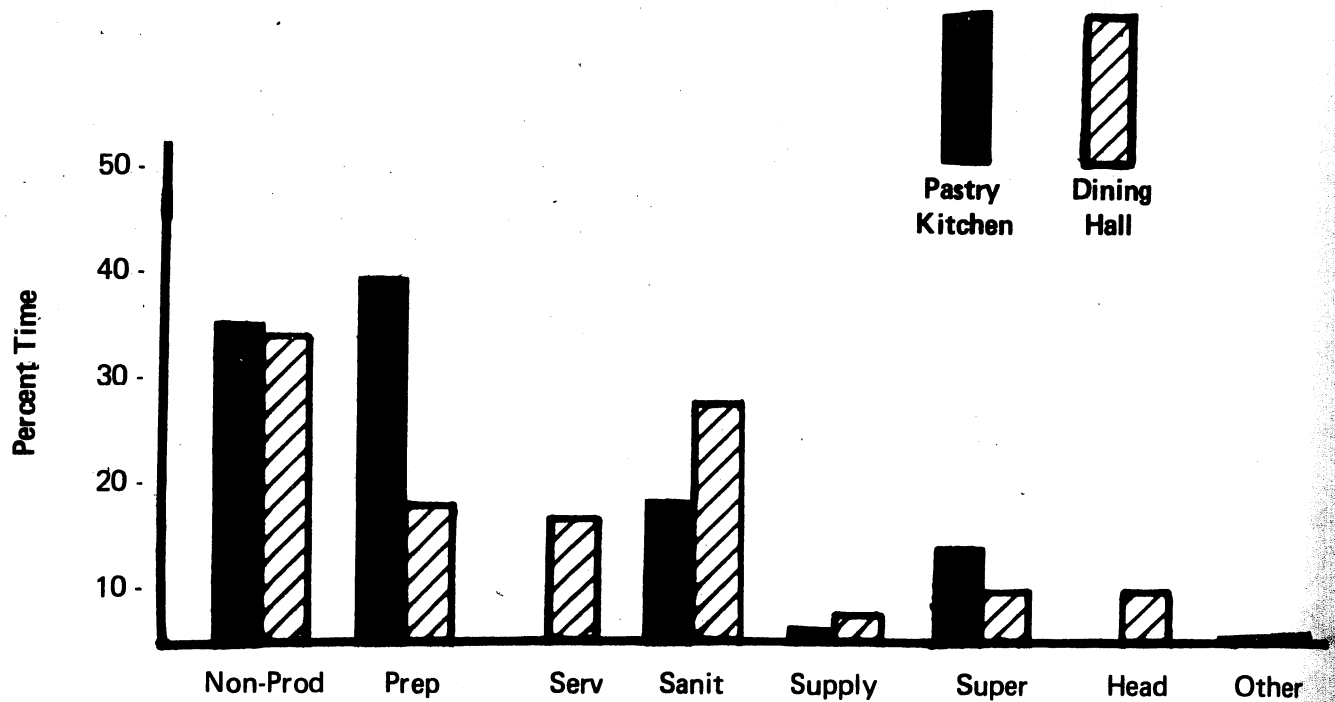
The graph in Figure 7 compares pastry kitchen and dining hall personnel allocations of time among the various work functions. At the bottom part of the figure is a breakdown of work functions among the individual job classifications in the pastry kitchen. This figure indicates that:

1. Non-productivity is approximately the same for both groups.
2. Neither serving nor headcount functions are performed in the pastry kitchen.
3. The pastry kitchen personnel spend a substantially greater (more than twice) percentage time in food preparation.
4. The percentage of time spent on sanitation is much lower in the pastry kitchen as would be expected (no dishwashing).

In addition, the data on the individual job categories reveal that the pastry kitchen supervisor spends 34.6% of his time performing direct work (preparation and sanitation), a marked difference from the dining hall supervisors' rate of 3.0%. This results from the small work force in the pastry kitchen, thus requiring the supervisor to perform many of the functions usually assigned to the cooks and shift leaders in the dining halls.

Figure 7

PASTRY KITCHEN PERSONNEL VS DINING HALL PERSONNEL



Work Functions

Pastry Kitchen Personnel (All):	33.2	38.6	0.0	15.6	1.3	10.7	0.0	0.6
Supervisor	31.3	31.8	0.0	2.8	2.1	32.0	0.0	0.0
Military Cook	37.8	33.8	0.0	18.0	0.5	8.1	0.0	1.8
Food Serv. Wkr.	30.9	33.6	0.0	26.4	2.8	6.3	0.0	0.0
Baker	33.2	55.0	0.0	12.3	0.0	1.2	0.0	0.0

V. CONCLUSIONS AND RECOMMENDATIONS

1. Productive work time of 67.8% in the entire system is comparable to that obtained from studies done at other Air Force installations (e.g., productivity was 63.4% for McGuire AFB study — see reference 4), which suggests that total staffing levels are not insufficient.
2. The actual staffing, whether compared with the authorized or standard levels, shows that Dining Hall 7 is relatively undermanned and that personnel assignments should be adjusted accordingly.
3. An analysis of productivity in the dining halls indicates discrepancies in manning levels between shifts for all facilities.
4. Supervisors spend approximately 50% of their time in non-productive activities, including required functions away from the dining halls. The resulting effect is insufficient supervision in the day-to-day operation of the dining halls.
5. The productive efforts of the military cooks are directed primarily toward supply, headcount, and the serving line. The functions of a military cook should be primarily related to the actual preparation and serving of food. Only in this manner can the Air Force develop a total "in-house" food service capability.
6. As civilian shift leaders are required to act in the capacity of dining hall supervisors when the supervisors are absent, a substantial portion of their time should be allocated to supervision rather than direct work (i.e., preparation, serving, and sanitation). Direct work should be delegated to lower-rated personnel, and the unnecessary shift leader positions eliminated if not required to perform their prescribed duties.
7. The civilian cooks are involved with cooking, preparation, and serving of meals or sanitation which accounts for approximately 95% of their productive time. This appears to be reasonable and consistent with their described duties.
8. Given the excessively high non-productive time in the inflight kitchen, an increase of about 30% over that observed in the dining halls and pastry kitchen, and comparing actual staffing with the authorized and standard levels suggest that a nominal reduction in number of personnel assigned to this activity is possible.
9. No apparent major discrepancies exist in manning, functions and distribution of workload in the pastry kitchen.
10. Leveling factors, i.e., adjustments for variations in the efficiency of the individuals, have not been applied to any of the work sampling data. The subjective judgment and opinion of the observers is that the worker efficiency in all jobs, is less than for comparable industrial and commercial operations — a result of many factors, including lack of interest, low morale, and poor training and skills.

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APPENDIX A
STATISTICAL
DATA AND TABLES

Table A-1

NUMBER OF OBSERVATIONS RECORDED

	Dining Hall Supervisor	Military Cook	Civilian Shift Leader	Civilian Cook	Food Service Worker	Baker	Total
Dining Hall 1	311	759	1810	1610	4909	0	9399
Dining Hall 3	261	786	667	1522	2722	0	5958
Dining Hall 7	229	1262	905	1361	2733	0	6490
Total All Dining Halls	801	2807	3382	4493	10364	0	21847
In-Flight Kitchen	75	219	121	106	57	0	578
Pastry Kitchen	144	222	0	0	178	180	724

Table A-2

DEGREE OF ACCURACY* (±%) WITH 95% CONFIDENCE

	Dining Hall Supervisor	Military Cook	Civilian Shift Leader	Civilian Cook	Food Service Worker	Baker	Total
Dining Hall 1	5.7	3.6	2.2	2.3	1.4	—	1.0
Dining Hall 3	6.2	3.5	3.7	2.4	1.9	—	1.2
Dining Hall 7	6.6	2.6	3.1	2.5	1.9	—	1.1
Total All Dining Halls	3.5	1.8	1.6	1.4	1.0	—	0.6
In-Flight Kitchen	11.5	6.8	8.7	9.1	12.5	—	4.1
Pastry Kitchen	7.8	6.7	—	—	7.1	7.4	3.6

*Calculated from the formula:

$$S = \sqrt{\frac{4P(1-P)}{N}} \times 100$$

where:

S = degree of accuracy (%)

N = sample size

P = largest % time spent on 1 category

Table A-3

PERCENT TIME OBSERVED AT WORK FUNCTIONS

	Supervisor			Military			Civilian			Civilian			Food Service			Grand Total			
	1	3	7	1	3	7	1	3	7	1	3	7	1	3	7				
Non-Productive	53.1	49.9	49.3	45.1	42.6	31.2	30.7	36.8	27.8	30.6	30.7	23.5	31.3	32.4	29.8	32.9	34.6	29.2	32.2
Preparation	0.3	1.5	0.0	0.0	0.5	21.0	28.7	30.8	33.1	29.0	28.4	30.1	8.9	3.9	3.8	15.2	12.6	16.6	14.9
Serving	0.0	1.9	0.0	0.5	8.4	16.0	15.3	11.7	9.1	25.0	28.2	31.7	13.8	8.2	7.5	14.5	13.5	14.2	14.1
Sanitation	0.6	3.0	1.7	2.6	6.7	7.0	7.7	6.6	7.9	7.7	8.8	11.7	39.7	48.6	52.5	23.7	26.1	27.1	25.4
Supply	1.9	3.5	1.3	30.9	16.8	0.0	0.4	0.0	0.3	0.2	0.2	0.7	0.1	0.3	3.9	2.7	2.6	1.9	2.4
Supervisory	36.4	39.1	43.3	9.1	18.2	2.1	11.8	10.3	17.3	1.5	1.7	1.9	0.7	0.2	0.6	4.8	5.8	5.0	5.2
Headcount	0.0	0.0	4.4	9.2	6.7	20.7	5.4	3.4	2.9	6.0	1.8	0.3	5.5	6.3	1.7	5.7	4.6	5.3	5.3
Other	7.7	1.1	0.0	2.6	0.0	2.0	0.0	0.4	1.6	0.0	0.2	0.1	0.0	0.1	0.2	0.5	0.2	0.7	0.5
%Total	3.3	4.4	3.5	8.1	13.2	19.5	19.3	11.2	13.9	17.1	25.5	21.0	52.2	45.7	42.1	43.0	27.3	29.7	100.0
Observation																			

Table A-4

NUMBER OF MEALS SERVED AND MAN-HOURS WORKED

Dining Hall 1

	S	M	T	W	T	F	S	S	M	T	W	T	F	S	Total
Breakfast	156	275	202	192	205	195	119	126	203	233	277	251	209	100	2643
Dinner	211	338	376	366	341	347	172	192	372	388	431	445	281	123	4383
Supper	211	156	175	198	192	140	238	323	216	237	242	228	115	179	2850
Late Evening	250	241	290	289	309	258	313	322	357	396	373	362	180	177	4117
Total Meals	828	910	1043	1045	1047	940	842	963	1148	1254	1323	1286	785	579	13,993

Dining Hall 2

First Shift	56	60	64	49	72	72	40	56	64	64	64	80	48	40	829
Second Shift	64	64	67	72	59	53	56	48	56	64	64	60	40	48	815
Third Shift	40	40	40	40	32	40	40	48	40	48	48	40	40	48	584
Total Hours	160	164	171	161	163	165	136	152	160	176	176	180	128	136	2228

Dining Hall 3

	S	M	T	W	T	F	S	S	M	T	W	T	F	S	Total
Breakfast	74	129	148	134	134	137	73	70	160	159	137	163	155	61	1734
Dinner	236	387	392	404	358	385	210	213	354	393	405	408	351	209	4705
Supper	—	230	221	246	211	184	—	—	215	235	232	233	123	—	2130
Total Meals	310	746	761	784	703	706	283	283	729	787	774	804	629	270	8569
First Shift	56	48	64	60	56	56	43	40	56	72	52	64	50	48	765
Second Shift	—	56	56	56	56	64	—	—	64	64	64	64	64	—	608
Total Hours	56	104	120	116	112	120	43	40	120	136	116	128	114	48	1373

Table A-4

NUMBER OF MEALS SERVED AND MAN-HOURS WORKED (cont'd)

Dining Hall 7		S	M	T	W	T	F	S	S	M	T	W	T	F	S	Total
Breakfast		186	248	284	284	277	293	274	275	338	339	380	338	285	217	3978
Dinner		370	431	432	487	463	467	436	476	530	531	522	490	405	318	6358
Supper		—	411	446	426	433	347	—	—	519	521	479	487	274	—	4343
Total Meals		556	1090	1162	1197	1173	1107	710	751	1387	1391	1341	1315	964	535	14,679
First Shift		72	80	96	96	80	88	72	72	80	88	88	80	88	64	1144
Second Shift		40	56	72	72	88	64	32	32	64	72	80	80	48	24	824
Total Hours		112	136	168	168	168	152	104	104	144	160	168	160	136	88	1968

APPENDIX B
FOOD SERVICE FACILITIES
PERSONNEL STAFFING LEVELS

Table B-1

DINING HALL STAFFING

	Shift:	Dining Hall 1		3	Dining Hall 3		Dining Hall 7	
		1	2		1	2	1	2
Dining Hall Supervisors	1	1	0	0	1	0	1	0
Military Cooks	3	3	1	1	2	2	2	2
Civilian Shift Leaders	3	3	3	2	1	1	2	1
Civilian Cooks	2	2	2	1	4	2	3	2
Food Service Workers	8	8	6	5	6	4	7	4
TOTAL	17	17	12	9	14	9	15	9

Table B-2

INFLIGHT KITCHEN STAFFING

	Shift:	1	2	3
Supervisor		1	0	0
Military Cooks		4	1	0
Civilian Shift Leaders		1	0	0
Civilian Cooks		1	1	2
Food Service Workers		<u>1</u>	<u>0</u>	<u>0</u>
TOTAL		8	2	2

Table B-3

PASTRY KITCHEN STAFFING

Supervisor	1
Military Cook	2
Baker	1
Food Service Worker	<u>1</u>
TOTAL	5

APPENDIX C
DATA COLLECTION FORM, DEFINITIONS
AND SAMPLING SCHEDULE

Figure C-1

WORK SAMPLING STUDY - TRAVIS AFB

DATA COLLECTION SHEET

Date

D/H Mo. Day

Observation Period

From to

Observer

Day

Col. 1
2
6
10
14
17

JOB :

TIME :

Col. 19
22
26
30
34
38
42
46
50
54
58

Table C-1

JOB CLASSIFICATIONS

1. **DINING HALL SUPERVISOR:** The E-7 or E-6 military supervisor in charge of the operation of the dining hall.
2. **MILITARY COOK:** The E-4, E-3, or E-2 military person who performs administrative and/or cooking functions in the dining hall.
3. **CIVILIAN SHIFT LEADER:** The WL-8 civilian responsible for assigning work to other civilians on his shift, or who performs actual cooking function.
4. **CIVILIAN COOK:** The WG-8 civilian who performs actual cooking functions in the dining hall.
5. **CIVILIAN FOOD SERVICE WORKER:** The WG-2 civilian who performs cleaning, dishwashing, and other related functions in the dining hall.
6. **BAKER:** The WG-8 civilian who performs baking functions in the pastry kitchen.

Table C-2

TASK DEFINITIONS

1. FOOD PREPARATION:

a. **Prepares for Cooking:** Obtains ingredients. Opens food cans, boxes, and/or bags. Places raw or precooked items into appropriate cooking, heating, or serving containers. Cuts meats and vegetables. Mixes ingredients as required.

b. **Cooks Foods:** Selects proper temperature settings, monitors food being cooked or reconstituted, and seasons food as required. Includes preparing eggs, hot cakes, french toast, meats, and other items on the serving line grill. Removes ready food from cooking utensils and places in serving or replenishing containers.

c. **Prepares Soups, Salads, Desserts, and Breads:** Includes all productive time required to prepare soups, salads, desserts, and breads and to transport to serving line or tables.

Soups: Obtains ingredients, opens soup containers and mixes ingredients for soups. Cooks, seasons, and pours into serving containers or individual portions.

Salads: Obtains ingredients. Cuts and cleans lettuce, cabbage, tomatoes, onions, and other salad ingredients. Mixes all salads and/or places salads in bulk or individual portions.

Desserts: Obtains ingredients. Slices serving portions of cakes, pies, or other desserts. Includes preparing bulk or individual portions of puddings, custards, or fruits.

Breads: Prepares toast, brown and serve rolls, and other pastry items prepared in the dining hall.

d. **Prepares Cooking Utensils:** Includes all productive time required for obtaining and prelocating pots, pans, spatulas, and other cooking implements in preparation for cooking.

2. SERVING FOOD:

a. **Serves Food:** Cuts individual portions of meat on serving line. Serves patrons in line. Serves eggs, hot cakes, french toast, steaks, hamburgers, hot dogs, and other items directly from the serving line grill. (Note: When items are prepared on the line grill and placed in a serving container prior to being given to the patrons, the task will be recorded in the preparation category. Only when the items are served directly to the patrons from the grill will the task be carried in the category of serving food.)

b. **Sets up, replenishes, and tears down serving line:** Includes all time required to place, replenish, and remove food from the serving line. Prepares utensils for serving. Makes beverages. Refills milk coolers and beverage dispensers.

3. CLEANS KITCHEN, EQUIPMENT, AND UTENSILS:

a. **Cleans cooking utensils:** Washes pots, pans, and other cooking utensils. Returns pots, pans, and utensils to proper locations or receptacles.

b. **Cleans equipment:** Cleans ranges, preparation tables, steam kettles, grills, mixers, deep fryers, ovens, vegetable and meat cutting machines, and other equipment.

c. **Cleans kitchen:** Sweeps and mops kitchen floor. Cleans refrigerator, freezer, and dry goods storage room. Empties garbage, cleans garbage cans, and garbage area.

4. CLEANS DINING HALL, CLIPPER ROOM, SERVING LINE, DISHES, SILVERWARE, AND GLASSES:

a. **Cleans tables:** Cleans tables of soiled silver, china, and serving trays, and transports them to the clipper room. Cleans paper, food particles, and spillage.

b. **Operates dishwasher:** Removes waste from dishes and serving trays and places them in wash racks. Monitors the washing of eating utensils. Removes clean dishes and utensils from racks and returns to proper receptacle or location.

c. **Cleans dining room and clipper room:** Sweeps, mops, waxes, and buffs dining room floor and hallway. Sweeps and mops clipper room floors. Cleans equipment in dining and clipper room. Cleans serving line. Rearranges, refills, and replaces salt, pepper, catsup, hot sauce, and other table condiments. Changes linen.

d. **Personal hygiene:** Engaging in any activity that would comprise good sanitation practice, such as washing hands after preparing raw meat, fish, poultry.

5. SUPPLIES:

a. **Receives supplies:** Unloads all incoming supplies at the dock. Transports supplies to storage area. Uncrates, unpacks, and stores supplies in appropriate location. (Non-perishable/condiments in storeroom, and perishable items in refrigerator/chill room). Maintains inventories and receipts for incoming food and expendable supplies.

b. **Maintains supplies:** Repositions stored supplies to insure that longest stored items are used first. Determines future subsistence requirements and places orders on AF Form 287 (Subsistence Request). Inventories supplies after each meal, daily, and when directed by food service supervisory personnel. Maintains supply records.

c. **Issues supplies:** Issues food supplies to senior cooks and records issues. Receives returned unused issues not used by cooks and annotates records indicating return. Buys out-of-stock items from other dining halls for immediate issue.

6. ADMINISTRATIVE:

a. **Prepares correspondence and records:** Drafts and types correspondence. Prepares various food control records. Maintains civilian employees personnel and pay records.

b. **Telephone:** Answers telephone and pages personnel.

7. SUPERVISORY:

a. **Monitors reports and OJT Program:** Monitors the preparation of required forms by senior cooks and shift leaders. Gives and monitors OJT.

b. **Coordinates:** Coordinates with other dining halls and base units on food requirements.

c. **Inspects:** Inspects dining hall to assure cleanliness and maintenance of good sanitation practices.

d. **Gives supervision:** A Dining Hall Supervisor or Civilian Shift Leader gives instructions to another Dining Hall employee (other than OJT).

e. **Receives supervision:** An employee receives instructions from a Dining Hall Supervisor or Civilian Shift Leader.

8. MESS CHECK:

a. **Cash collection and headcount:** Checks customers ID's, that headcount sheets are signed and monies collected when required.

9. MISCELLANEOUS:

a. **OJT:** Receives OJT.

b. **Maintenance:** Performs minor maintenance on facility and equipment.

10. NON-PRODUCTIVE:

a. **Designated Rest Break:** Consists of those times that are for employee coffee breaks or other assigned rest periods.

- b. **Other:** Consists of all non-productive activities not defined elsewhere.
- c. **Absent:** Employee is not to be found on the premises.
- d. **Walking:** Employee is walking from one area to another, or within an area without any apparent purpose.

Table C-3

OBSERVATION SCHEDULE

Observation Period	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
0100 — 0300					1*					1		1									
0300 — 0500													1				1		1		1
0500 — 0700	1	1		7				3	3	1			1	7			7	7	3		3
0700 — 0900			1		7	1		3	3	1						3		7	7	1	3
0900 — 1030	3	3	1				1	1	7	3				3			7		7		1
1030 — 1330			3	1	3					7	3	1		7	1	7		1		3	7
1330 — 1500	3	7	3	1		3		3		7						1					
1500 — 1700			7					1		3	7			3	1	1		3	7	1	
1700 — 1900	1		7	3					7					1			3	1	3	1	7
1900 — 2100				1																	
2100 — 2300	1	1																			
2300 — 0100			1						1												1

*The three dining halls at Travis AFB are designated 1, 3 and 7.

UNCLASSIFIED

Security Classification

DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY (Corporate author) USA Natick Laboratories Natick, Massachusetts 01760		2a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED	
		2b. GROUP	
3. REPORT TITLE A Work Analysis of Food Service Personnel at Travis AFB, California			
4. DESCRIPTIVE NOTES (Type of report and inclusive dates) Technical Report July 1973			
5. AUTHOR(S) (First name, middle initial, last name) Mark M. Davis John R. Wetmiller			
6. REPORT DATE July 1973		7a. TOTAL NO. OF PAGES 49	7b. NO. OF REFS 7
8a. CONTRACT OR GRANT NO.		8b. ORIGINATOR'S REPORT NUMBER(S) TR-74-35-OR/SA	
b. PROJECT NO.			
c.		9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report)	
d.			
10. DISTRIBUTION STATEMENT Distribution of this document is unlimited.			
11. SUPPLEMENTARY NOTES		12. SPONSORING MILITARY ACTIVITY USA Natick Laboratories Natick, Massachusetts 01760	
13. ABSTRACT			

DD FORM 1473
1 NOV 65REPLACES DD FORM 1473, 1 JAN 64, WHICH IS
OBSOLETE FOR ARMY USE.

UNCLASSIFIED

Security Classification

14.	KEY WORDS	LINK A		LINK B		LINK C	
		ROLE	WT	ROLE	WT	ROLE	WT
	WORK	8					
	ANALYSIS	8					
	FOOD	9					
	FOOD SERVICE	9					
	FOOD DISPENSING	9					
	PERSONNEL	9					